

Commercial Latex Agglutination Test for Rapid Diagnosis of Group B Streptococcal Infection in Infants

BETTE J. WEBB AND CAROL J. BAKER*

Departments of Pediatrics, Microbiology, and Immunology, Baylor College of Medicine, Houston, Texas 77030*

Although latex agglutination assays for detection of a variety of bacterial antigens in body fluids from patients with systemic infection have been shown to be useful as rapid diagnostic techniques, lack of commercial availability has restricted their application. The Streptex latex test kit for the detection of group B streptococcal (GBS) antigen in admission body fluid specimens was evaluated for sensitivity and specificity in 54 infants with meningitis and in 10 infants with normal cerebrospinal fluid (CSF) parameters. GBS antigen was detected in 22 of 28 (78.6%) CSF specimens by latex agglutination and in 23 of 28 (82.1%) by countercurrent immunoelectrophoresis. Antigen was present in 21 of 28 (latex agglutination) and 19 of 26 (countercurrent immunoelectrophoresis) CSF specimens after the initiation of antimicrobial therapy. Heat-labile factors accounted for nonspecific agglutination reactions with latex suspensions other than group B in 3 of 28 CSF samples from patients with GBS meningitis. These nonspecific reactions were readily eliminated by heating specimens for 10 min at 100°C. Fifteen patients with GBS meningitis had admission serum and urine samples collected in addition to CSF. Antigen was detected by latex agglutination and countercurrent immunoelectrophoresis in 14 of 15 (93.3%) and 13 of 15 (86.7%) concentrated urine specimens, respectively, and in 12 of 15 (80%) CSF specimens and 4 of 15 (27%) sera by each method. These findings indicate that the Streptex latex test is a rapid, sensitive, and readily available method for detection of GBS antigen in admission body fluid specimens from infants with meningitis.

It is well documented that latex particle agglutination (LPA) is a sensitive and specific method for the detection of a variety of bacterial antigens in body fluids from patients with systemic infection, particularly meningitis (2, 4-6). Compared with countercurrent immunoelectrophoresis (CIE), a more widely used technique, LPA requires no special equipment or trained personnel for its performance, and, in most instances, it is more sensitive than CIE for the detection of soluble polysaccharide antigens in body fluids (3, 7). However, one disadvantage of agglutination assays has been their limited availability.

Recently, a commercial latex test kit has been developed for the serological differentiation of group A, B, C, D, F, and G streptococci from broth and solid culture media. Since the group B *Streptococcus* is the most common pathogen associated with meningitis occurring during the first 2 months of life in our hospitals, this study was designed to evaluate the usefulness of the Streptex latex kit in detecting group B streptococcal (GBS) antigen in body fluid specimens from infants in this age group.

MATERIALS AND METHODS

Admission cerebrospinal fluid (CSF) specimens were collected from 67 infants and centrifuged, and the supernatants were stored at 4°C until testing. Among these 67 patients, the following diagnoses were noted: culture-proven bacterial meningitis (43 patients), aseptic meningitis (11 patients), GBS bacteremia without meningitis (3 patients), and normal CSF (10 patients). Fifteen of the 28 patients with GBS meningitis had admission serum and urine specimens collected for testing in addition to CSF. Urine was concentrated 25 to 50 times in a Minicon B15 concentrator (Amicon Corp., Lexington, Mass.). Twenty-six CSF specimens obtained after the initiation of antimicrobial therapy in 15 patients with GBS meningitis were also available for testing.

Streptex latex grouping reagents (Burroughs Wellcome Co., Research Triangle Park, N.C.) were kindly supplied by Max Moody. For each test, a single drop of each of the streptococcal reagents (groups A, B, C, D, F, and G) was mixed with a wooden applicator stick on a clean glass tile with a drop of CSF, serum, or urine, rotated manually for 60 s, and examined for agglutination. A positive result was indicated by the clearly visible clumping of a single latex suspension with a body fluid specimen. The absence of agglutination with the remaining latex reagents served as controls. A negative result was indicated by a lack of

agglutination with each of the six streptococcal latex reagents.

CIE was performed with a plastic electrophoresis chamber (Hyland Laboratories, Costa Mesa, Calif.) in plates prepared with sodium barbital buffer (pH 8.6) in 1% agarose and hyperimmune GBS rabbit antisera prepared in our laboratory. These methods have been detailed elsewhere (1).

RESULTS

Admission CSF from 28 patients with culture-proven GBS meningitis was evaluated with LPA and CIE. Twenty-two (78.6%) and 23 (82.1%) of 28 CSF specimens had GBS antigen detected by LPA and CIE, respectively. CSF specimens from 15 patients with bacterial meningitis due to organisms other than group B *Streptococcus* were uniformly negative by LPA. The etiological agents isolated from these 15 patients were *Streptococcus pneumoniae* (2 patients), *Haemophilus influenzae* type b (6 patients), *Neisseria meningitidis* (4 patients), *Listeria monocytogenes* (2 patients), and *Proteus mirabilis* (1 patient). In addition, CSF from 11 patients with aseptic meningitis, 10 with normal CSF parameters, and 3 with GBS bacteremia without meningitis gave negative LPA reactions.

False-positive agglutination reactions with streptococcal grouping reagents other than B were noted in the CSF of three patients with documented GBS meningitis. Heat treatment of these three CSF specimens for 10 min at 100°C eliminated these nonspecific reactions, but did not change the positive reaction with the group B reagent. This indicates the heat-stable character of the polysaccharide antigen. In addition, CSF from one patient with *L. monocytogenes* and one with GBS bacteremia without meningitis agglutinated with all of the latex group suspensions except B. Heating of these specimens eliminated all false-positive agglutinations.

Fifteen patients with GBS meningitis had all three admission body fluids (CSF, serum, and urine) available for testing by LPA and CIE (Table 1). Antigen could be detected in at least one specimen in 14 (93.3%) of these patients'

TABLE 1. Comparison of LPA and CIE for detection of GBS antigen in admission body fluid specimens

Assay	No. of positives (%) in body fluid specimen on admission ^a		
	CSF	Serum	Concentrated urine
LPA	12 (80)	4 (26.7)	14 (93.3)
CIE	12 (80)	4 (26.7)	13 (86.7)

^a Fifteen patients had all three body fluids available for testing.

TABLE 2. Persistence of GBS antigen in CSF

Time (days)	No. positive/no. tested (%)	
	LPA	CIE
0	22/28 (78.6)	23/28 (82.1)
1	8/8	8/8
2	6/7	6/7
3-10	6/6	5/6
>10	1/5	0/5
Total specimens positive after admission	21/26 (80.8)	19/26 (73.1)

admission body fluid specimens by both techniques. Concentrated urine was the single best source for detecting group B antigen. Fourteen (93.3%) and 13 (86.7%) of 15 concentrated urine specimens were LPA and CIE positive, respectively. Antigen was detected in 12 of 15 (80%) CSF specimens by either method. Serum was not a reliable source for detecting GBS antigen in patients with meningitis (26.7% positive).

Persistence of group B antigen in the CSF of 15 patients was detected in 80.8% of 26 subsequent CSF specimens by LPA and in 73.1% by CIE. Only three of these specimens yielded positive cultures. GBS antigen in the CSF of these patients was detected for mean durations of 2.9 days by LPA and 2.3 days by CIE (range 1 to 11 days) (Table 2).

DISCUSSION

These data indicate that this commercially available latex particle agglutination assay (Streptex) is a sensitive and specific method for the rapid diagnosis of GBS meningitis. When compared with the more commonly used technique for the detection of bacterial antigens, CIE, LPA was comparable in sensitivity to CIE in detecting GBS antigen in CSF (78.6 and 82.1%, respectively), serum (26.7%, each), and concentrated urine (93.3 and 86.7%, respectively). Similar findings have been reported by other authors for meningococcus (5), *H. influenzae* type b (6), and group B *Streptococcus* (2) when evaluating research laboratory-developed latex assays. Even when high-titered rabbit antisera prepared in our laboratory were used for CIE, LPA was more sensitive than CIE (80.8 versus 73.1%) for the detection of GBS antigen in CSF after the initiation of antimicrobial therapy. This finding may be of importance in facilitating the diagnosis in patients who have received antimicrobial agents before admission.

One problem encountered in this study was the occurrence of nonspecific agglutination reactions with latex suspensions other than group B in several patients with GBS meningitis and with all latex suspensions except group B in one

patient with *L. monocytogenes* and one with GBS bacteremia without meningitis. However, heat-labile factors accounted for these reactions, and these were easily eliminated without significant loss of volume.

These findings indicate that the Streptex latex test is a rapid, simple, and accurate method for detecting GBS antigen in admission body fluid specimens from infants with meningitis. It is commercially available and requires no special equipment, and results can be obtained within several minutes. Nonspecific agglutination reactions for CSF specimens with reagents other than group B, though infrequent, can readily be eliminated by heat treatment of CSF. These attributes suggest that Streptex may be a valuable tool for use in the routine hospital laboratory in providing the rapid diagnosis of GBS infections in infants.

ACKNOWLEDGMENTS

We express our gratitude to Claudia Jackson for collection of clinical specimens, Jo Ann Bynes for secretarial assistance, and Ralph D. Feigin for review of the manuscript.

This work was supported in part by a grant-in-aid from Wellcome Reagents Division, Burroughs Wellcome Co., Research Triangle Park, N.C., and by Public Health Service

grant AI 13249 from the National Institute of Allergy and Infectious Diseases. C.J.B. is the recipient of Public Health Service Research Career Development Award 1 K04 AI 00323 from the National Institute of Allergy and Infectious Diseases.

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